DRIVER

SIX MORE NEW CAR CRASH TESTS FOR 1985

page 13

SCENE OF THE CRIME !

APRIL 1985

SCENE of the CRIME

"A Consultation with Sam Marlowe, Detective."

(This is an accident investigation fantasy, but only in part. Our characters are imaginary, but the accidents they discuss are real. This article is written in the hope that our readers can learn from the fatal mistakes of others.)

The painted letters on the frosted-glass pane in the door said "Sam Marlowe, M.I." I walked in without knocking and passed the receptionist's empty desk to enter the inner office. I was expected.

Marlowe turned from the window and waved at the chair across the desk from him.

"Sit down, Mr. Carswell," he said.

He sat in his chair, stubbing out the end of his cigarette in an ashtray that already held a pack and a half, and tapped a stack of brown file folders in front of him.

"Okay, I've read these. You don't need my help on them."

I hesitated; I wasn't prepared for that. The folders contained reports on automobile crashes that I'd been given by the head of my detective agency. I had

dropped the reports off with Marlowe the day before, hoping that as an expert he would be able to help me make some recommendations on them to our clients, who wanted to reduce the auto accident problem. But now he was throwing the whole thing back to me.

"Sure I need your help," I protested. "I have to come up with some reasons why these accidents happened, and I'm stumped."

"So?" said Marlowe behind the smoke of a freshly-lit cigarette.

"So, you're the mishap investigator."

"That's what it says on the door," he agreed, tugging on his right earlobe.

"So, I need you to investigate the accidents in those reports and suggest some possible remedies for my clients."

"I get two hundred dollars a day," he reminded me as he sat back in his chair. "And expenses."

I shifted uncomfortably in the chair.

"The accidents happened all over the country — the world, really," I said, "and there are hundreds of them. We can't possibly afford to foot the bill for sending you to investigate each of them." I hesitated again. "Maybe I could send you to look at a couple of them, but I don't know if that would be good enough . . ." I finished lamely.

He let out a short laugh.

"Relax, kid," he said. " 'Rex,' is it?"

I said it was.

"Okay, look. I can give you a few pointers on how to look at these things. It's not so hard to figure them out, at least not for what you need. You just want to make some recommendations? For that, I may not need to personally inspect each accident scene. These reports will probably give you enough of a look at the 'scene of the crime' to do the trick."

"You think so?" I said, keeping relief out of my voice.

"Yeah, why not?" He fingered through the pile of folders and selected one. "Let's try this one. I made a few notes here on some of the clues. 'A slick road with sleet falling. Two cars going in opposite directions.' Sounds a little ominous, doesn't it?"

An oncoming vehicle lost control on the icy road and caused the accident. However, both cars were traveling well above a safe speed, considering the weather and road conditions.

COLD AS THE GRAVE

"These are the details, so pay attention. The time of this one was the middle of the winter. The morning was cold and the roads were extremely slick and icy, with the rain falling as sleet. The temperature was at the freezing point. A man was driving to work by his normal route, which usually took him about 30 to 35 minutes to travel, depending on traffic and weather. On this day, he had left home about 6:45 and by 7:35 he was still seven miles from the office. He was headed north. Headed south was another car which came over the top of a hill and skidded across the yellow center line. The cars, both traveling about 50 miles an hour, collided head-on. The impact totalled both cars and they came to rest on opposite sides of the highway. Our subject was rushed to a hospital with severe chest injuries. He died about 11:30 that morning.

"The man's wife said he had worked his normal shift the day before and had had a quiet evening at home, going to bed at 10:30 and rising at 6:00 a.m.

"Okay, what went wrong? The driver had enough rest, and he hadn't had any alcohol either that day or the day before so he wasn't impaired."

"It was the weather," I said. "He couldn't control that. And the other driver skidded, which caused the accident."

"Yes, but aren't you missing something? His speed. He was going 50 miles per hour on an icy road with frozen rain falling."

"But it was the other guy who skidded."

"Sure. But our friend was going just as fast so he could have done the skidding just as easily as the other guy."

"Maybe he was late to work," I said.

"Maybe, but that doesn't excuse him. The road was much too slick for the speed he was driving. Maybe he would have been killed anyway, even if he had been traveling a safe speed; we don't know. But maybe he would have avoided the accident altogether. Some of the responsibility may have been his; his speed could have contributed to the accident.

"So, the recommendation you could make on this accident is that you should remember the idea of 'speed too fast for conditions.' No matter what the speed limit signs say, you can't go that fast if the road and weather conditions are poor. In this case they were lousy, and he paid the ultimate price."

"Isn't it a little heartless to blame a person for his own death?" I asked. "Besides, what good does it do?"

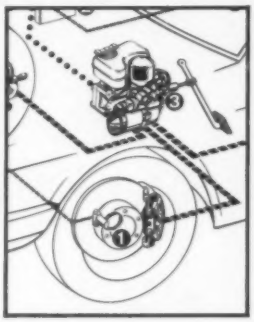
"First of all, I'm not blaming anyone, certainly not in a legal sense. I'm just trying to find out what went wrong and that involves looking at responsibility. As to what good it does: For the dead person it does no good at all, but for those who are still living it can mean a lot. There

continued

DRIVER

The Scene Of the Crime 1

Braking Like a Professional 8



So You Want to Drive Over 55? 14

True Accidents 12

Six More Crash Tests For '85 13

What Motorists Should Know About Motorcycles 16

Double Tech 20

License Requirements In The USA 22

The Backyard Mechanic 24

Backfire 28

A Safety Puzzle Back Cover

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continued

The sign on the door said "Sam Marlowe, M.I.," for "mishap investigator."

is a humanitarian interest involved in deciding who is responsible. You see, these accidents could have been prevented, or at least lessened in severity somewhat. If we can see what was done wrong — by *all* the people involved — we can learn how to keep these things from happening again.

"Keep that in mind while we look at another one of these accidents."

WRONG WAY TO DEATH

He opened another file and pulled out some papers.

"Here are some clues. Young man on a new motorcycle. A lot of alcohol. A wrong turn.

"Now here are the circumstances. A young Air Force member bought his first motorcycle on the morning he was to go to another base for 'temporary duty.' He rode the 75 miles to the base and rented a motel room at about noon. He rested for a while and then had dinner. At five that afternoon he met some co-workers in the motel cocktail lounge. They drank beer and socialized; later nobody could remember how much they drank. At 1:50 in the morning the airman left the bar to visit a friend who lived about three miles away.

"He put on his helmet and drove east on a road intending to turn left to enter a highway for the trip north to the other town. He passed through the intersection of an access road that ran parallel to the highway and then stopped at a stop sign at the intersection with the highway. The highway was a four-lane, divided road with only the stop sign controlling access.

"At this point he made a left turn to go north on the highway. However, he made his turn into the southbound lanes of the highway rather than going beyond the median and getting into the proper, northbound lanes. He traveled only three-tenths of a mile before he encountered a car that was going the right way — south. Both car and motorcycle were going about 50 miles an hour; both were in the right southbound lane. The airman tried to take evasive action by changing lanes; so did the driver of the car. They both went the same way and crashed head-on in the left southbound lane. The motorcycle was pushed about 49 feet in the opposite direction.

"The airman hit the front end, hood and windshield of the car. He was dead at the scene from internal injuries."

He put the papers down.

"What do you make of those facts?" he asked.

"Well, first of all, he was probably drunk," I said.

"Right," said Marlowe. "The autopsy showed his Blood Alcohol Content or 'BAC' was .192. As you know, that's a measure of the amount of alcohol in the bloodstream, with .10, or a tenth of a percent, equalling intoxication for legal purposes. Since he was at .192, he was very nearly twice the legal limit. He was drunk, all right. What else can you see?"

"Well, there's that access road. It might have confused him, especially since he was drunk. Maybe he thought it was the northbound lanes of the highway."

"Evidently he did," agreed Marlowe as he lit yet another cigarette, "since he turned into the first thing after the access road, which was the southbound side of the highway. You can see how drunk he was — he thought the stop sign was in between the lanes of the highway. But he shouldn't have made such a mistake because he was assigned to this same area only a short time before this incident. He was familiar with the traffic pattern in the area. He was just too drunk to think straight."

SHARING THE GUILT

I was beginning to warm up to the discussion.

"It was his first motorcycle," I said, "and this was the first day he had owned it. Inexperience could have played a part."

"Not really," he said, looking at the papers in the folder. "It's true he was inexperienced, and he had not attended the Air Force's motorcycle training, but that probably wasn't a factor in this accident."

"Why not? Wouldn't a more experienced rider have done a better job of avoiding the accident?"

"That's debatable. He might have. But there was a slight rise in the road at the area of the crash, and this obscured the sight of the motorcycle from the car and vice versa. This reduced the time they had to take action to avoid the crash."

"So it was just the drunken condition of the motorcycle rider that caused the accident," I concluded.

"And possibly another factor," said Marlowe. "The driver of the car had also been drinking. He wasn't operating at full efficiency either."

"Then they're both at fault," I said.

"Don't forget the other responsible parties."

I asked him who he meant.

"The Air Force member's friends in the motel lounge. They allowed their friend to go riding on that motorcycle in a highly intoxicated condition. They bear some responsibility."

continued

continued

A specialist in mishap investigations, Marlowe was the man I consulted to get ideas for remedies to the traffic accident problem.

"But they were probably drunk, too. They couldn't have noticed his condition."

"Yeah, but remember I'm not talking about legal responsibility," he said. "We're looking at ways to stop this kind of thing from happening again."

"So what do I recommend to my clients?"

"Tell them not to drink too much. Tell them not to drink at all before they drive. Tell them not to let their friends drive after drinking. Tell them to be familiar with the area they drive in. And tell them to have the proper training if they plan to ride a motorcycle."

"You said those last two things wouldn't have made any difference in this accident."

"No, but they are good pieces of advice anyway. Another good piece of advice is to 'drink like your life depended on it.' That shouldn't be news to anyone, but a lot of people seem to be unaware of it."

KEY TO THE MYSTERY

Marlowe riffled through the pile of folders on his desk until he found one he wanted.

"In this next one, we have a lot more information, because one of the principals in the accident survived. It involves alcohol again. A lot of these accidents you gave me involve alcohol, but of course drunk driving is a major problem everywhere, all the time. However, from this one we can learn some different things in addition.

"The circumstances of the accident seem fairly straightforward: Two highly intoxicated women in one car ran off a wet road when the temperature was slightly above freezing. They hit a guard rail, rolled over several times and came to rest in a ditch. The driver was not wearing her seat belt and she died; the passenger was wearing a belt and she survived with minor injuries.

"The actual details give a different picture than that short summary, and they include a few of what they would call 'red herrings' in mystery novels.

"The driver, an airman, went to work at 2:00 p.m. at her job in the kitchen of a bowling center. Her friend, the wife of another airman, came to work at 2:30, and both got off work at 7:30 that evening. They went to their homes to change clothes and then to a local NCO club, where they drank from 9 p.m. until about 12:30 a.m. They went to another club, where they had more drinks until 2 a.m., and then they returned to the first club, staying until it closed at three.

"A witness saw them at the second club and he said they had several different kinds of mixed drinks, and a few straight drinks. He said they were happy, and he noticed that the friend had driven to and from the second club. The airman's friend said that another man in the club asked the airman to come over to his place, but she refused.

"When they were finally leaving the NCO club at closing time, the airman took the car keys from her friend, saying that she was in no condition to drive. The friend said later she thought she was much drunker than the airman. She said the airman seemed in control of herself.

"They decided to spend the night at the friend's home. As they were driving there,

the airman realized she didn't have her barracks key. She became very upset, thinking that the man from the bar had her key. She made a U-turn and went to his apartment building, but he wasn't at home. They turned back toward the friend's home, and the friend fell asleep on the way. She woke up and saw they were three miles out of their way. She asked the airman 'Where are you going now?' and the airman said 'I'm taking you home.'

"The friend said the airman began talking about her lost key as though she were obsessed with it. The airman turned to her, grabbed her arm and said 'I can't find my _____ keys!'

"At that point, the friend said she felt them hit a bump and then go airborne. That's the last thing she remembered until she was being taken out of the car by the ambulance attendants.

EXAMINING THE CLUES

"Now here are the circumstances at the accident scene. The car was going north on a smooth, two-lane highway. The road was unlighted and wet, and it bent slightly to the left at the point of the accident. The car itself was in good shape, except for a worn right front tire.

"Apparently, the airman turned to her friend just as they approached the bend and she never saw it. The car continued

"These accidents could have been prevented." Marlowe knew if we could discover the different factors that had led to the accidents, we could suggest ways to prevent similar crashes from occurring.

Entering the wrong side of a divided highway, the intoxicated motorcyclist soon met a car that was traveling in the opposite — and correct — direction.

straight ahead and left the right side of the road, hitting a curb and then a guardrail. It went over the guardrail and down a small embankment. It was probably on its right wheels because some dirt was found beneath the right front undercarriage. The car flipped once and came to rest upright on a tree stump.

"The car was found about 4:45 in the morning by two people. One of them stayed with the car while the other went for help. A doctor declared the airman dead at the scene.

"The autopsy discovered she had multiple skull fractures and a very high level of alcohol in her body. She had not worn her seat belt. The friend had only a broken nose and a few facial cuts. And she had a minor bruise on her right shoulder from her seat belt's shoulder harness.

"She said she was confused about that because she never wore seat belts. She said someone must have buckled her in before they started. She was also confused that the airman was not buckled in, because she said the airman always wore a seat belt.

"That's the story," concluded Marlowe. "What's your guess?"

"Well, like you said, it's alcohol. The driver was very drunk. The driver and her friend spent several hours drinking several different kinds of very potent drinks."

"Yeah, but keep going; there's a lot more to it than that."

"Okay," I said. "The airman took the car keys away from her friend because she thought she was too drunk to drive. But the airman couldn't drive safely either."

"Right," said Marlowe. "The friend should have told herself 'If I'm in no condition to drive, then obviously she isn't either.' But she made her decision on the basis of appearances. The airman thought she could drive safely, but she couldn't. That's one of the problems with alcohol — it interferes with judgment. So who's responsible on the question of alcohol?"

"They both were," I said, and added, "plus maybe the witnesses who saw them drinking all that booze and didn't persuade them not to get into the car."

"Good. Now how about the accident itself?"

"The driver looked away from the road at just the wrong time," I said. "She was inattentive to the main task of driving, because she was worried about her keys. And then, of course, the road was slick, like in that first accident we looked at. And there was that worn tire on the right front side of the car. It could have affected the handling of the car."

"You're right on the inattention, but the other two probably weren't factors in the crash."

"Why not?"

"Well, sure the road was wet, but the car didn't skid; it just ran straight off the road. The temperature was 37 degrees and there was no ice. As for the front tire, it didn't play a part because the driver didn't steer or hit the brakes at the time of the crash. She just wasn't watching the road and she ran off."

THE RESPONSIBLE PARTY?

"Is that it, then?" I asked.

"Not quite. When you make your recommendations, you'll want to mention alcohol, of course. And you'll want to tell them to pay attention to their driving at all times. Even though they didn't affect this particular accident, you'll want to suggest keeping the car in good shape — watching the condition of the tires, brakes, steering and all that — and driving more slowly on wet or icy roads. But there are still some other recommendations that would be suggested by the facts in this case."

"I give up," I said.

"You should recommend that people not drive when they are emotionally upset. The driver got very upset about the keys, and she made a fatal mistake."

"I should have thought of that."

"And another thing is fatigue," Marlowe said. "The airman and her friend were probably pretty tired. They had done a lot of work and then were out drinking the rest of the evening. Fatigue will complicate the effects of alcohol. Of course, she would have been in bad shape

continued

"I can't find my _____ keys!" The driver — drunk, upset and preoccupied — turned to look at her passenger at precisely the wrong moment. She never saw a left bend in the road and a guardrail.

even if she had slept for hours before beginning that drinking spree, but we're looking for all the recommendations we can make."

Marlowe paused to light up another cigarette, although the air was so thick with smoke he looked hazy only a few feet away.

"This accident suggests another recommendation for you," he said. "It's an odd way for it to come up, but in this one someone, somewhere *did* take a little responsibility for someone else."

"You mean the fact that the survivor was buckled in."

"Right. Maybe the driver buckled her in and then failed to buckle herself in as she normally did, because this time she was drunk. We don't know; but however it happened, that person is alive because of the seat belt, and because somebody decided to look out for her."

"It's too bad somebody didn't look out for them when they were driving. It looks like most of these accidents involve drinking drivers, or drivers who are impaired in some other way."

"Like I said, a lot of them do," Marlowe said. "Alcohol is involved in at least half of the fatal auto accidents each year. Some estimates say 60 percent."

THE CASE OF DEAD MAN'S CURVE

He dug into the stack of reports in front of him again.

"Here's one where alcohol doesn't figure in. It can teach a couple of different lessons. See if you can figure them out.

"A man was packing his belongings for a move, and a woman friend was helping. The morning of the accident they drove in separate cars to the city where he lived, loaded both cars and then they both went back to the base in her car. He was driving. On the way they made several stops so it was about eight in the morning when they went by a construction site. This was the man's normal route to work and he knew the road well. It was posted for 60 kilometers per hour in that area because of the construction site, but he was speeding.

"While he was negotiating the curve he tried to pass a slower-moving vehicle. Because of his speed he went wide and the car hit a sign on the left side of the road. He steered back to the right but he overdid it and hit the car he was trying to pass. At that point he lost control and the car hit a metal guardrail on the right side of the road. It went over the guardrail and fell 20 feet between a couple of bridge supports that were being built. The car landed on its right side and then rolled onto its top. The woman was killed and the man suffered neck and back injuries. He was tested for alcohol, but he hadn't been drinking.

"What do you see here?" asked Marlowe.

"He was speeding," I said.

"Right. And?"

"And he tried to pass on a curve," I said.

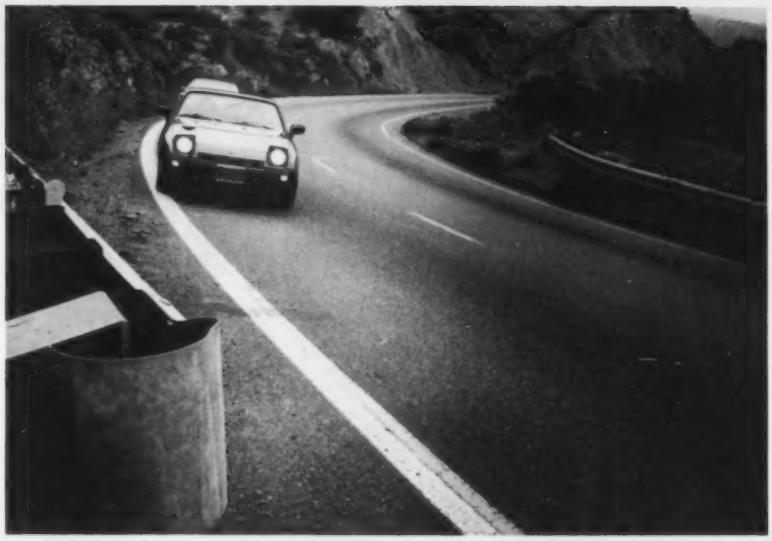
"Good. Any guess as to why he made those mistakes?"

"I think maybe he was overconfident, since he drove that road every day. He thought he could handle the curve at a higher speed, and he thought he could pass the other car in the curve. He was wrong."

Marlowe smiled.

"I think you've got the idea now."

He started to shuffle the folders into a neater pile.



Overconfidence, most probably, caused the driver to attempt a pass on a curve. He collided with a sign, then the other car, and finally went out of control.

THE BODY OF THE EVIDENCE

"You mean it's really that simple to figure these things out?" I asked.

"Nothing that involves people is ever simple. But by examining the clues you can at least come up with some possible explanations and some possible ways to deal with the traffic accident problem. Just remember to look at everything and everyone involved. Don't overlook the possible contributing effects.

"Just because a driver was speeding doesn't mean he wasn't also drunk behind the wheel. And if he was drunk, did somebody have a chance to keep him from getting in the car? Just because somebody runs a red light doesn't mean the other driver is totally innocent. Did he look around enough to make sure nobody was coming?

"I'm not saying that there aren't accidents that simply couldn't have been avoided. All I'm saying is that those accidents are the minority. In the vast majority of cases, something the driver did caused the accident or contributed to it. Or something he failed to do. Or something that someone else did or failed to do. Responsibility is everywhere. People need to understand that if they want to avoid these things happening to them or someone they care about."

"You mean I *am* my brother's keeper," I suggested.

"Something like that," he agreed.

I got to my feet, gathered the reports together and tucked them under my arm. I thought of his fee.

"A lot of this just seems like common sense," I said.

Marlowe also rose to his feet, and his next statement told me he had read my thoughts.

"Sure it's common sense. That's how I make my living, pointing out the obvious to people who should have been able to see it for themselves but didn't. I'll be sending you a bill."

He smiled as we shook hands so I knew there were no hard feelings. I left to find some fresh air.

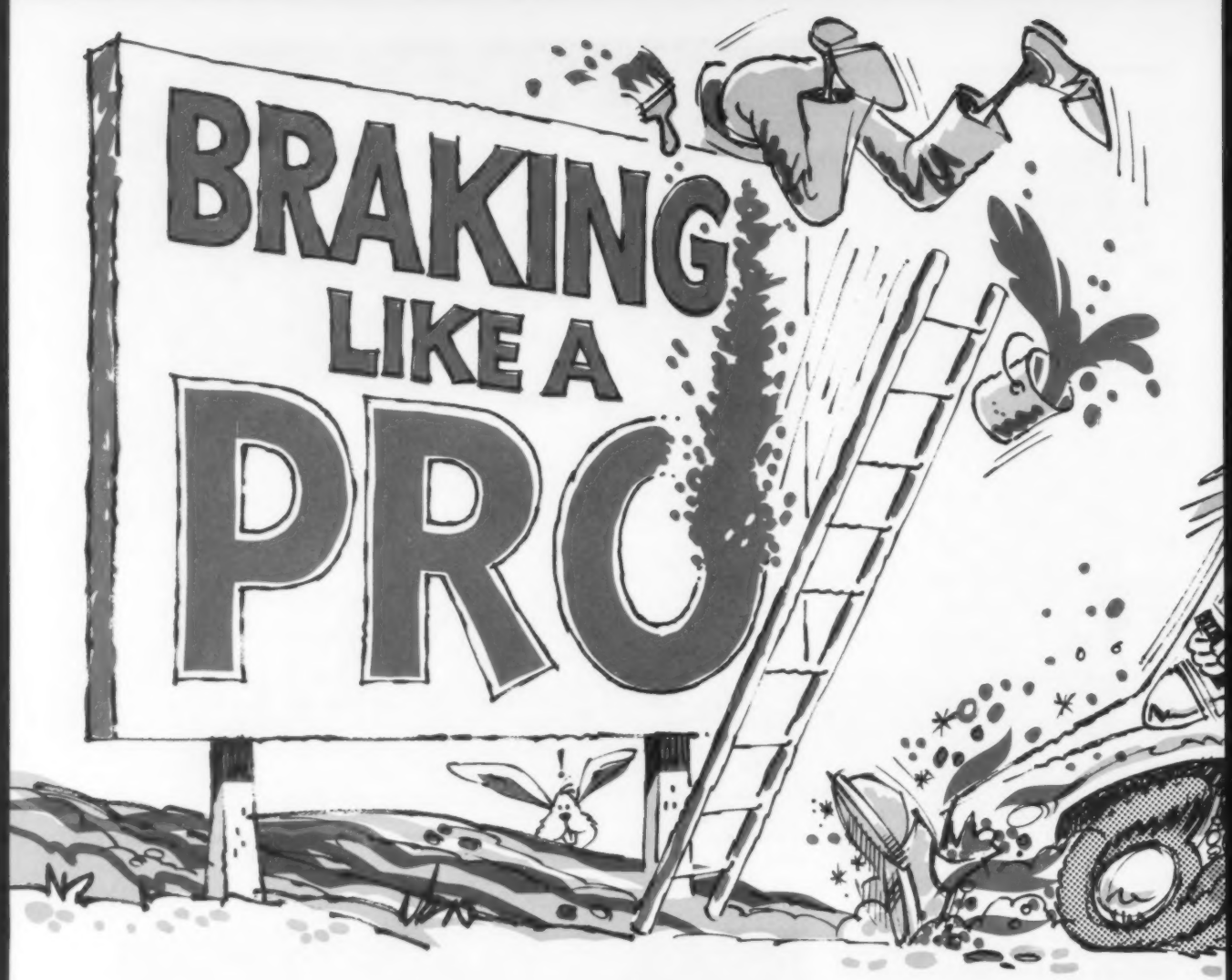
The Scene of the Crime notes

Our special thanks to Captain Philip Schuyler and Sergeant Mike Stodelle of the San Bernardino County Sheriff's Department and to the California Highway Patrol for their assistance with the photographs for this article.

(The "accident" pictures here are meant only as illustrations of the real-life crashes, not as accurate representations.)

"A good piece of advice is to 'drive like your life depended on it.' " Marlowe's opinion was that we are responsible not only for our own safety, but also for that of the others on the road.

BRAKING LIKE A PRO



What do you do when you have to stop in an emergency? For most drivers the only course of action is to slam on the brake pedal, lock all four wheels and ride out the skid.

The biggest problem with locking up the brakes is that you lose all directional control. There is no steering a car that is sliding along on what amounts to four squares of melting rubber. The only thing you can do if you have to steer around something with the brakes locked is ease off the pedal until the brakes unlock, make your steering input, correct the vehicle's course and get back on the pedal.

However, failure to get all four wheels to lock at the same time can be even worse than skidding straight ahead. You see there is a law of physics that makes whichever wheel is locked want to be the leading wheel on the vehicle.

That's not too bad if you manage to lock both front wheels; the car will continue to skid straight ahead. But if you only lock one front wheel the vehicle will dart sideways so that wheel is in front of the others. For example, if the left front wheel were to lock, the rear of the car would jump out to the left so that the left front wheel was ahead of all the rest.

The worst case is of course when you lock either or both rear wheels. Then the rear of the car wants to be the front and the car spins around.

There are times when one wheel locks and the other doesn't because of conditions outside the driver's control. This occurs when one wheel is on a different surface than the other. Examples include different road surfaces (asphalt versus concrete; paved versus gravel), oil or water on part of a lane, gravel or sand on the road, snow, ice . . .

One wheel can lock and the other not when the vehicle is loaded differently on one side than the other. This can be the result of how occupants and baggage are located in the car or it can come from forces on the vehicle such as cornering.

For the professional driver these problems rarely occur. First of all, s/he keeps alert so as to avoid getting into a situation where the brakes are the only way out. But even when faced with an emergency braking situation the pro can usually slow or stop the vehicle in a shorter distance than other drivers can with all four wheels locked up and still maintain

During a panic braking situation anti-lock braking systems maintain, among others, the ability of steering. So the driver can steer around obstacles when the deceleration during a panic-braking situation alone will not avoid an accident.

steering control.

The professional driver develops a feel for the brakes that allows him or her to pump the pedal so that the wheels are kept at a point just short of locking. Not only does this produce the shortest possible stopping distance, it permits steering because the wheels are always rolling.

Studies carried out in Germany on accidents involving locked wheels showed that up to 7.5 percent of all accidents could have been prevented if the driver had been able to maintain directional control during braking. Bluntly stated by a spokesperson for Robert Bosch GmbH, "Even the best brakes can do nothing to keep the driver from over-reacting in an emergency."

To give all drivers the advantage of the professional when it comes to maintaining steering during emergency stops, several companies are now producing anti-lock brake systems. Four-wheel anti-lock brake systems also prevent the inherent instability that results from rear axle overbraking.

Simply stated, four-wheel anti-lock brake systems produce the shortest stopping distance and allow the driver to steer around obstacles in the event of an emergency stop. In addition, unexpected curves and slippery road surfaces become less dangerous.

As a spokesperson for Alfred Teves GmbH, the major independent brake manufacturer in the world, said, "As long as drivers respect the laws of physics, four-wheel anti-lock systems will compensate for misjudgments in many situations, where a conventional brake system would be overextended."

The first anti-lock systems introduced in 1978 in Germany in top-line cars have already demonstratedd their effectiveness. A wider use on nearly every type of passenger car is now possible as a result of a new integrated system, according to Teves. This new system also produces better performance during "normal" braking situations.

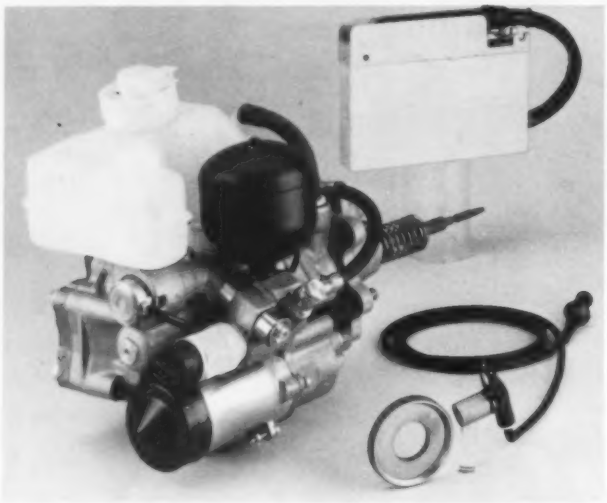
Meanwhile, Lucas Girling has developed the Stop Control System (SCS) for small and medium sized front-wheel-drive cars equipped with diagonally split brake systems. With SCS, front-wheel-drive cars can be designed to include a braking control system with a sticker price which is substantially lower than that of currently available electronic anti-

continued

lock systems such as those produced by Teves and Bosch.

For more than 20 years engineers have been working on anti-lock brake systems. By the early '70s they were conducting long-term practical tests on electronically controlled systems. Although these systems proved their efficiency over several million miles of testing, their analog control techniques were superceded by the development of microelectronics.

By the late '70s the first units were ready for production. Some were "add-on" designs that required much installation space. But even the more compact designs were not sufficiently developed for use in a wide range of vehicles at a reasonable cost. The need to be compatible in the broadest range of vehicles has been linked to the feasibility for large volume production which would then enable the safety benefits to be enjoyed by a wide range of motorists.



Except for the electronic controller and the wheel sensors, all components of the Teves Anti-Lock MK II are grouped together in a modular design comprising the brake fluid reservoir, the solenoid valve block for pressure modulation, the hydraulic brake booster and master cylinder, the power pack with electronic motor, pump, hydraulic accumulator and the pressure warning switches.

A comparison with a conventional vacuum brake booster which is nowdays installed in almost every passenger car, clearly shows the compact, space-saving design of the hydraulic unit of the new Teves Anti-Lock MK II.

Some systems are designed as a set of compact components — rotational speed sensors, an electronic control unit and a hydraulic modulator — that can be mixed and matched to any vehicle with hydraulic brakes. They use inductive rpm sensors to "read" wheel speed and feed their signals to the electronic control unit, where they are continuously evaluated. If the signal indicates that a wheel is locking, the control unit "commands" the hydraulic modulator to decrease brake line pressure.

Magnetic valves in the modulator can lower line pressure quickly, hold it steady or increase it again — all, according to the road surface, at from 4 to 15 cycles per second. With this pulsating application of the brakes, no wheel ever actually skids and the vehicle can be steered, retaining its directional stability.

The Bosch Antiskid System (ABS) tests itself every time the vehicle is started and every time it comes to a stop. ABS simulates for itself a braking sequence and evaluates its own signals. And gives the driver a signal if anything is amiss.

ABS also keeps tab on itself during driving, constantly checking its most important functions and components. Should it detect a defect anywhere in the system, ABS turns itself off, leaving normal braking unaffected, and signals to the driver with a warning light that it has done so.

Teves' latest system incorporates in one compact weight-optimized unit the function of a hydraulic brake booster and hydraulic control of the anti-lock system. With this fully integrated concept, the under-hood installation space is no more than that for a conventional vacuum booster and master cylinder. The Teves Anti-Lock Mk II bolts to the fire-wall in place of the normal brake booster, needing no extra hydraulic connections.

With this integration of the hydraulic brake boosting function, Teves claims that under normal braking (which is more than 98 percent of all brake applications), the driver can appreciate the instant response and superior pedal feel with minimal pulsation, yet reduced reaction times during anti-lock braking.

The Teves system has been designed to control all four wheels, whereby the front wheels are controlled individually and the rear wheels together. The rear wheel first

tending to lock triggers the control cycles for both rear wheels.

Teves' electronic controller uses a microprocessor. The controller receives the four wheel sensor signals independently from each other and calculates numerical values whch correspond to wheel speed and slip. These values are processed by the electronic controller into solenoid valve command signals for brake pressure modulation.

At 80 mph, for instance, almost 8,000 sensor signals per second are being processed. Though the anti-lock cycles up to 12 times a second, depending on road conditions, the control algorithm for a "smooth" modulation means that braking forces are as near as possible to the optimum tire-to-road adhesion.

The use of two microprocessors allows a sophisticated safety concept to monitor the function of the entire Teves Anti-Lock System, i.e. redundancy by doubling the control logic.

Two identically programmed microprocessors receive the same set of input signals. Proper operation assumed, both of these processors must generate identical valve command signals and internal data such as vehicle reference speed. These sets of data are independently checked by two comparators in the microprocessors. If the comparators indicate non-identical data, each processor can independently cut off the controller while maintaining the conventional brake function with a warning indication to the driver.

On the other side, external signals originally generated without redundancy, such as sensor signals, have to be vertified for their plausibility content. If a plausibility criterion is violated the conventional brake function is restored with a warning indication.

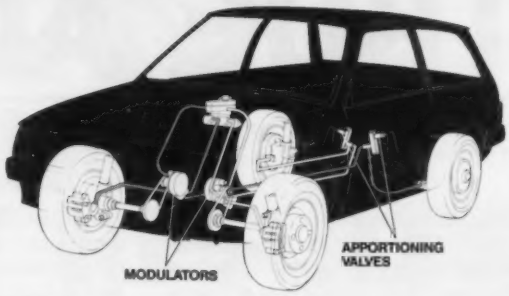
Lucas Girling's Stop Control System has two modulator units operated by toothed belts from the drive shafts on either side of the transmission of the front-wheel-drive arrangement. No other source of energy is needed. Each of these units comprises an integrated sensor, pump and brake pressure modulator. It should be noted that the pump operates only when the unit is cycling, and therefore contributes no drag in normal driving. The unit's function is to control not just the adjacent front wheel, but also the diagonally opposite rear wheel (left front, right rear or right front, left rear) through a pressure proportion valve.

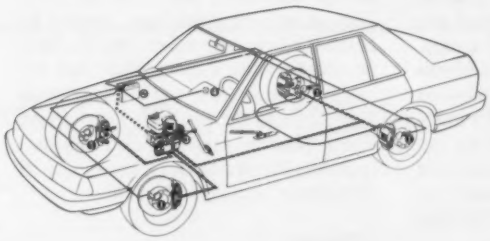
When the sensor determines that a front wheel is approaching a predetermined deceleration threshold, the modulator reduces the pressure in the respective brake circuit. When the wheel speeds up again, the pump raises the pressure to bring the braking force back to the appropriate level.

The whole process takes place several times a second, and because the wheel doesn't lock, the driver can decelerate the car in a stable manner. Lucas Girling confidently expects that SCS will be a widely used brake control system because its cost will bring it within the scope of the family-car purchaser. They add that mechanics will have no difficulties servicing the SCS since there is no need for the added complication of electronic test equipment.

Compare the Teves Anti-Lock MK II system . . .

. . . with the Lucas Girling SCS system.





The Teves system includes (1) sensors, (2) electronic controller, (3) the hydraulic unit and (4) a warning lamp.

A spider's thread (about 0.002 mm diameter) lapped around the spool valve of a Teves Anti-Lock system would cause a reject of the electronical quality control system in the production line.

The goal of all anti-lock brake systems is to ensure that the driver has the opportunity of retaining control over the vehicle under emergency braking conditions, by maximizing the available tire-to-road adhesion when trying to avoid a potential accident situation, in a manner that has previously only been achievable by professionally executed cadence braking. Under such braking conditions, a vehicle fitted with an anti-lock braking system can retain directional stability even on slippery road surfaces, particularly where differing road surfaces create the rapidly changing levels of tire-to-road adhesion.

TRUE ACCIDENTS

Following are a few reports of accidents involving Air Force members. We have removed names and references to dates and places.

FOLLOWING DISTANCE

At 1245 a sergeant was driving his car near his base with his wife and infant son. They were in the middle lane of a three-lane road. Traffic was stopped ahead and the sergeant didn't see it in time to stop. He slammed on the brakes and the wheels of the car locked up. The car skidded sideways, hitting the left rear of a stopped car. The car continued into the oncoming lane of traffic and was broadsided by a garbage truck. The sergeant was dead on arrival at the hospital. The baby died the next day.

OVERCORRECTION

An airman was traveling south on a highway about eight miles from his base. He took a corner too wide and overcorrected, losing control of the car. The car flipped several times and landed on its wheels. A witness saw the accident in his rearview mirror, stopped and pulled the airman from the car. The airman was taken to the base hospital, where his head injuries were judged too severe. He was transferred to a civilian hospital, and later to a larger facility. He died there 17 days later.

LIVING PROOF

An officer and an NCO were driving in a mini-compact car near an overseas base. They were traveling west on a highway when the truck they were passing moved into their lane, forcing them toward a median. The car hit a pothole and the driver lost control. The car hit the concrete curb of the median, spun around, hit the curb again and then rolled two or three times. Airborne and spinning, it tore through the median fence and took out several metal posts before coming to rest in the eastbound lanes of traffic. The car was completely destroyed. The two occupants were saved becaue they had stopped just five minutes before the crash and buckled their seat belts.

CYCLE/ALCOHOL

An airman rode his motorcycle to a friend's house at 1800. He had had contact lenses only one week and told his friend this was the first time he had worn them while riding his motorcycle and the air irritated his eyes. They repaired a loose connection on his motorcycle headlight. Between 2100 and 2300, the airman had at least three beers. He left about 2300 to go back to the base, wearing his helmet. About four miles from the base, he collided with a dump truck that was parked with its rear end sticking about four feet into the roadway. He received severe head injuries and died two days later. His Blood Alcohol Content was .13 at the time of the crash.

FATIGUE?

A sergeant got up at 0600 and worked his normal shift until 1600. About 1640 he reported to his second job and worked until about 2240. After that, he and some co-workers went to three different places for drinking and socializing. His friends noticed he was gone at about 0300 and could not find him. About 0330, the drivers of three emergency vehicles that were responding to an accident saw the sergeant. They were in the left lane and he was standing at the right side of the road, trying to hitchhike. He was wearing white pants, a black shirt and a white tie, so he was highly visible. The highway had no shoulder, only an area of low vegetation on the side. The sergeant was standing on the road surface near the solid white line bordering the highway. A car in the right lane about five seconds behind the emergency vehicles struck and killed the sergeant. Investigators discovered the driver had a Blood Alcohol Level (BAL) of .106, and they decided he had unconsciously moved to the right for the emergency vehicles and did not see the sergeant. They also concluded that the sergeant had been tired and alcohol (BAL .039) had contributed to the fatigue. This led to his impaired judgment in standing on the roadway, trying to hitchhike.

MARITAL PROBLEMS/ALCOHOL

A sergeant had been separated from his wife for eight days. He visited her twice in one evening, the second time after he had been drinking, and they had a heated argument. He reported for work at 0645 the next morning, worked through lunch and left work at 1510. He picked up a friend at 1630 and took him home. He spent several hours there, talking, watching TV and drinking screwdrivers. He had not eaten all day, so at 2030 he left to go home, eat and go to bed. He apparently changed his mind, because he drove in the direction of where his wife was staying. After being on the highway only a quarter of a mile, he lost control because of his intoxication and hit the guardrail on the center median. The car veered back onto the highway and rolled. The sergeant was ejected through the windshield, sustaining massive head and chest injuries. He died at 2200 in the hospital. His Blood Alcohol Level was .21.

CYCLE/SPEED

An airman first class and a senior airman left their overseas base at 1100 to go to lunch, riding two motorcycles that belonged to the senior airman. Witnesses saw them riding at more than twice the speed limit, possibly racing. As they rounded a left hand curve the airman first class, who was closest to the centerline, went into the opposing lane of traffic and hit an oncoming car. He continued on and hit another car. With that impact he was thrown from the motorcycle, and he tumbled along the highway until he hit still another car. His helmet remained in place throughtout the mishap. He died shortly afterward from massive internal injuries. At the time of the accident the airman first class was not authorized to operate a motorcycle, and the owner was riding without a license, which had been revoked for moving violations.

HORSEPLAY/ALCOHOL

After leaving night courses at a college, a civilian and a sergeant consumed two six-packs of beer, then had dinner. They decided to visit a city about 30 miles away and drank another six-pack before they left. On the way to the city, at about 0030 hours, they were engaging in horseplay when the civilian lost control of the car. The car ran off the right shoulder and traveled about 40 feet before hitting a concrete culvert. It went on another 55 feet and then rolled over, throwing both men out. The sergeant was pinned underneath the car for four hours, and he died of asphyxia.

SIX MORE 1985 CRASH TEST RESULTS

VEHICLE	SPEED/WEIGHT	HIC Driver/Pass	CHEST G'S Driver/Pass	FEMUR LOADS Driver left/right	Passenger left/right
AMC Renault Alliance 2-Dr Convertible	34.9 / 2810	1519 / 2678	62 / 47	175 / 280	630 / 1185
Chevrolet Astro Van	34.8 / 4090	2202 / 1597	70 / 61	1845 / 940	1160 / 725
Mitsubishi Galant 4-Dr Sedan	35.0 / 3360	747 / 986	52 / 42	910 / 960	480 / 440
Plymouth Caravelle 4-Dr Sedan	35.1 / 3170	685 / 760	51 / 35	800 / 1150	990 / 700
Plymouth Reliant 4-Dr Sedan	35.0 / 3060	831 / 843	54 / 44	1085 / 925	840 / 595
Volkswagen Jetta 4-Dr Sedan	34.8 / 2844	898 / 1008	50 / 51	362 / 396	711 / 516

The National Highway Traffic Safety Administration (NHTSA) recently released results of six more crash tests involving 1985 motor vehicles. The results of five other vehicles were announced in the March issue of *DRIVER*. The test results are part of the federal safety agency's experimental New Car Assessment Program (NCAP). NHTSA is testing a total of 40 motor vehicles in its 1985 program.

All the vehicles were crashed in frontal tests at 35 mph into a fixed barrier. The crash tests are designed to indicate, for vehicles within the same size class, the relative levels of occupant protection and vehicle safety performance. This is five mph faster than the prescribed speed for compliance with federal motor vehicle safety standards.

NHTSA said that while the test results are indicative of relative crash protection provided to occupants wearing safety belts, it is important to emphasize that, in the government's crash test program, only one car of any given make and model is crashed in a specific test. Subsequent crash test results for any vehicle could vary because of differences in the way cars are manufactured and equipped or due to slight variations in test conditions.

Instrumented dummies are used in all tests, and they are protected by the vehicles' standard safety belt system. The head, chest and upper legs of the dummies are equipped with instruments which monitor impact forces and accelerations. The head acceleration is used to calculate the head injury criterion (HIC), a measure of the potential for head injury.

In general, the lower the HIC, the less likely drivers and front-seat passengers would be seriously injured or killed in a frontal crash at 35 mph. A HIC value of 1000, a chest deceleration of 60 G's (G is a unit of acceleration), and a femur (thigh) load of 2250 pounds indicate approximate thresholds above which serious injuries are expected.

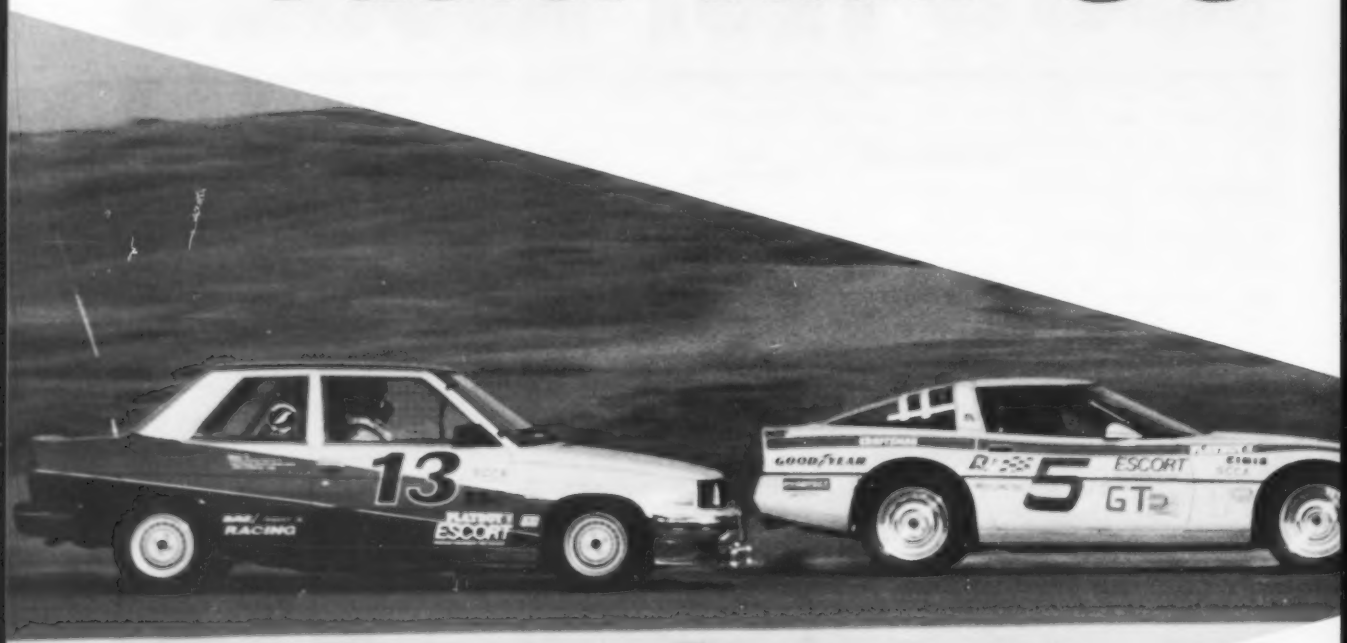
Other aspects of safety performance also are monitored, including whether the vehicles retain the windshield during the crash (Standard No. 212), prevent displacement of vehicle parts into the windshield area (Standard No. 219), and maintain the integrity of the entire fuel system to prevent leakage of fuel in a crash (Standard No. 301). Of the six most recently tested vehicles, only the Plymouth Reliant 4-door sedan failed any of these tests, that being 212.

The experimental NCAP began in 1979. The agency is continuing to examine several aspects of the program such as the variability in test results and the relationship of these tests to real world accidents, in order to improve crashworthiness information provided consumers.

The accompanying chart shows the test results for the six vehicles most recently tested. The five previous model year 85 test results are in the March 85 *DRIVER*.

▶

So You Want To Drive Faster Than 55



(above)
If you think you want to drive faster than 55 mph, maybe you'd better take a look at what the Sports Car Club of America requires in the way of safety equipment for their street stock classes.

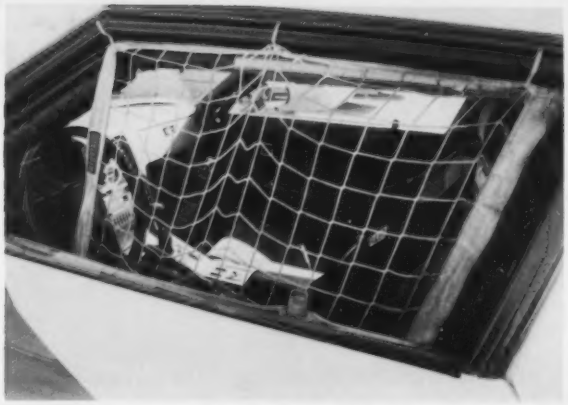
Yes, we can hear you. You think the 55-mile-an-hour speed limit is too slow. You want to drive faster.

But just for a moment, stop and think what would happen if you hit something traveling at higher speeds. Don't tell us you aren't going to have an accident. If people knew they were going to have one, they wouldn't be called accidents.

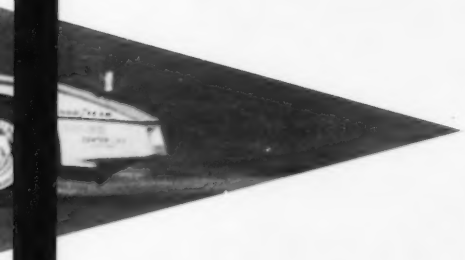
As we all should know, today's cars are required to be built so that when the occupants are wearing the installed safety equipment, a 30-mph frontal impact is survivable. That means that if you're paying close attention at 55 mph it will take 106 feet to get the car slowed from 55 to 30 mph for the survivable impact.

Where's the 106 feet come from? The brain has a perceptual lag of 0.1 second which at 55 mph means the car would

Note the oversized safety harness and roll cage the SCCA requires to improve the safety of street cars for racing and . . .



. . . there's also a mandatory window safety net and fire extinguisher required.



Regardless of the safety equipment you've installed in your vehicle, if you drive faster than 55 at night, you're overdriving your headlights and will not be able to see a hazard before it's too late.

cover 8.07 feet before the driver's brain gets the message the eyes have seen something. Recognizing that what has been seen is a danger takes another 0.5 second during which the car covers another 40.34 feet. Making the decision to do something about the danger can take from 0.15 to 0.85 seconds. Assuming the fastest decision making process, the car would cover another 12.10 feet. The minimum reaction time after that is 0.3 second or another 24.2 feet before the brakes are actually applied.

If the car's brakes and tires are in good working condition and the road has an even surface that doesn't have oil or water on it, at best it would take another 21 feet to shave 25 mph off the speed slowing the car from 55 to 30 for the impact.

Meanwhile, for those of you who want to drive faster than 55 mph, consider that at 70 mph for example the perceive-recognize-decide-react process takes 108 feet, or two feet beyond the impact point. The forces in a 70-mph impact are nearly five and a half times greater than those in a 30-mph collision.

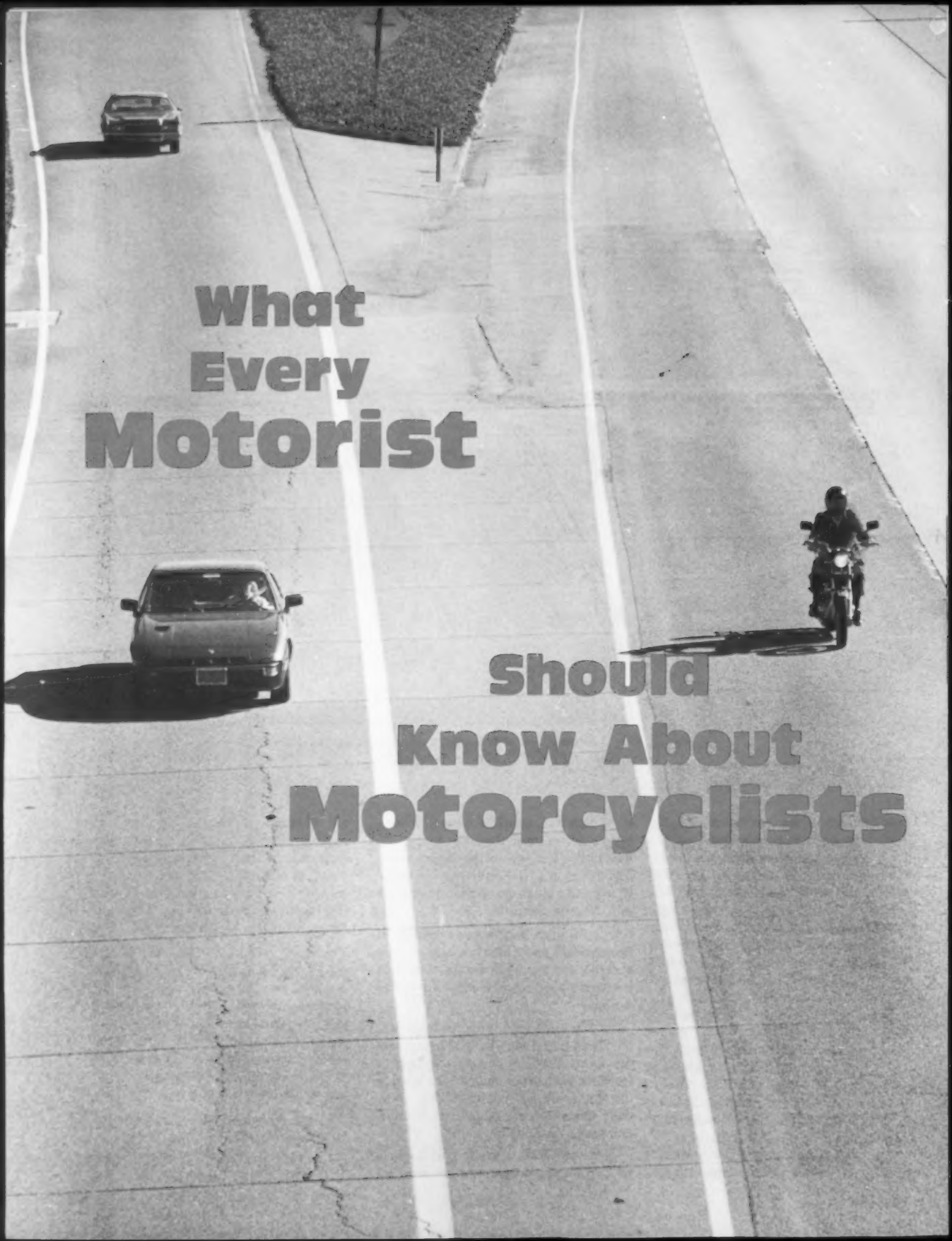
In a 30-mph impact you can end up bruised, sore and with a few broken parts and still survive. With forces more than five times as great, the odds of survival are nil.

OK, you still want to drive faster than 55? Then take a look at what equipment the Sports Car Club of America requires on Showroom Stock automobiles used in the Playboy U.S. Endurance Cup. Basically these cars are bought on Monday and raced on Sunday.

They are 1981 through 1985 models with required safety equipment installed but without any further modificatins to any part of the car other than normal maintenance called for in the factory shop manuals. The safety equipment necessary for speeds above the national legal speed limit includes safety harness, roll cage, fire extinguisher and window net.

However, even with this same equipment installed in your street car, you still wouldn't be safe driving faster than 55 mph because you would not be driving under the same controlled conditions racers have on the track. For example, on the race track very seldom is there cross traffic, and never do you meet somebody going in the other direction.

So the bottom line is: If you want to drive faster than 55, join a sanctioned racing group and confine your activities to the track.


What
Every
Motorist
Should
Know About
Motorcyclists

(right)
Experienced motorcyclists ride in a variety of lane positions.

You're right; you are seeing more motorcycles than you used to. Three years ago where you might have seen only 100 motorcycles, today you'll probably see 225. There simply are more bikes on the road.

Of course the key here is to *see* the motorcycle and its rider(s), which is not always easy. To state the obvious: Motorcycles are smaller than other vehicles so you have to look for them.

We've all had conversations where suddenly we realize that the other person is talking but we are hearing words that make no sense. This happens because the other person isn't saying what we were expecting and we have become confused between what we anticipated and what was actually said.

The same thing happens with vision: You usually see what you expect to see. If you aren't looking for motorcyclists, you may not see them. Granted the smaller bikes do tend to blend in well with their surroundings, but most motorcyclists do everything they can to be seen. They ride with their lights on and wear bright colors.

There's an additional problem associated with not seeing certain motorcyclists: The ones we tend not to see are the less experienced ones. They are riding smaller bikes and because they are inexperienced they don't always realize that car drivers

continued

(left)
As a four-wheel driver you have to anticipate what a motorcycle rider is going to do, just as you have to with any other traffic.

continued

have a hard time seeing them. In addition, they are the riders most likely to make mistakes that put them in danger from other traffic.

You can get some clues about what a rider might do by what s/he's wearing. The experienced rider will be wearing bright colors, a helmet, heavy-duty clothing, gloves and boots. Such motorcyclists are not likely to do anything to place themselves in danger.

A less experienced rider will be wearing darker colors and may not have all the proper safety gear on. Not only is s/he harder to see, s/he may not react properly when forced into a dangerous situation.

And if you see a rider wearing shorts, no shirt, no gloves, no helmet and flip-flops, the chances are s/he may do something dangerous. After all, s/he has already shown how unaware of danger s/he is by riding without the proper equipment.

Once you've seen a motorcycle you should prepare for moves the rider may make that could put you both in jeopardy.

The experienced motorcyclist will ride

While their reasons may not be readily apparent to four-wheel drivers at first, there are usually some very good reasons for any lane position changes motorcyclists make.

This motorcyclist's evasive maneuver could just as easily put him nearer the opposing lane. Would you have provided him enough room to do so?

(right)
Because motorcycles are smaller than most other vehicles they are harder to see, especialy when approaching from the rear. You have to look for them.

in a variety of lane positions (see the April 1983 *DRIVER* for some of these). There are times when s/he is going to change positions. Some of the time s/he is changing position to avoid something that can be a hazard to all traffic such as a pothole. At other times the lane positioning is changed because of something that is a hazard only to the motorcycle. Such hazards include bridge gratings, wet leaves, rain, railroad tracks, cobblestones, ruts, rain groves and joint lines.

As with other traffic, you have to anticipate what motorcyclists are going to do, and allow them room to do it. Therefore, the two-second following rule applies equally to all traffic. That is, when you are following another vehicle there should be at least a two-second gap between their rear end and your front end.

Be especially cautious when passing a motorcycle so as to not cut back in too soon. Not only is your vehicle a hazard to the motorcyclist, but the wake your vehicle leaves in the air can cause the rider to have control problems.

This brings us to the problem of blind spots — those areas that all vehicles have where the driver can't see. Just because you've checked your mirrors and glanced over both shoulders doesn't mean that it's clear to make a sideways move. There could be a vehicle lurking in one of your blind spots. Always signal your intentions just in case. Even if you think there are no other vehicles for miles, signal anyway.

Intersections are where most accidents between motorcycles and cars happen. And most of these accidents are the fault of the car driver failing to yield right of way and turning left in front of an oncoming motorcycle.

As was pointed out earlier, motorcycles are hard to see. Very often the cycle is hidden from view by glare or obstructed by other vehicles. In addition, it is extremely hard to judge the speed of an approaching motorcycle. So, if you're not really sure there is enough room to make your turn safely, play it safe and wait for the motorcycle to pass.

There are all kinds of excuses heard at accident scenes from "I didn't see him" to "Yeh, I saw him but I turned anyway." However, none of them will make a hapless motorcyclist who's sprawled out on the pavement feel any better.

tech DOUBLE TECH WITH TSGT RON LATHROP

COMMENT: I own a 1974 subcompact which has what seems to be an unsolvable problem. I need to bring the engine rpm to (around) 800, but the lowest it will go is 950 rpm. The problem is not improper timing, throttle cable free-play, nor choke valve. I turn the idle adjusting screw fully *counterclockwise* separating the screw from the cam. Such action should stop the engine from running, but it continues turning on 950 rpm. After I turn the idle adjusting screw I also turn the mixture adjusting screw *clockwise* until it touches the seat (fully clockwise). This action should also stop the engine, but it does not do so. The car is now using an excessive amount of fuel, and, sometimes (under sudden acceleration) the engine backfires. What could be the problem?

REPLY: The actual specifications for idle speed adjustments on your vehicle call for the headlights to be ON and the cooling fan off when adjusting the idle to 800 rpm, plus or minus 50. Without these conditions, the idle cannot be set correctly.

Ideally you have to have an exhaust gas analyzer to get the proper idle speed and mixture. Under the proper conditions, the idle should be adjusted to obtain a CO level of 1 to 3 percent. If the specified level can't be obtained within the limits of the idle limiter cap, stop the engine and remove the cap. Then remove the idle adjuster screw and blow compressed air through the passage in the carburetor to ensure that it is open. Reinstall the screw, start the engine and adjust the screw to obtain a CO level of 2 percent. Then reinstall the limiter cap with its tab opposite the carburetor stop. This should produce a quarter of an inch adjustment.

Your base auto hobby shop should have an exhaust gas analyzer.

If you cannot locate an exhaust gas analyzer, then you still have to follow the specifications (light on, fan off). After removing the idle mixture limiter screw cap, turn the mixture screw out (counterclockwise) until the engine speed drops. Now turn the screw in (clockwise) until the engine reaches its highest rpm. If this engine speed is above the specified idle rpm, reset it to specifications. Continue to turn the screw in (clockwise) until the idle speed drops 40 rpm. Then replace the limiter cap.

If this doesn't work, then either the secondary system is causing problems or — more likely — the carburetor needs to be rebuilt. Most carburetors on subcompact cars need to be rebuilt about every 40,000 miles or at least every four years. Based on age, your car is about due for its third rebuilding. In which case a new carburetor might be a better bet.

COMMENT: I have a '76 compact with a four-cylinder engine. The car runs perfectly. It always starts on the first try, despite the fact it has 91,000 miles on the engine. My problem is that I do a lot of highway driving. Once I get on the expressway and hit 70 or higher, after about five minutes the car will just slow down to about 50 mph. No matter how many times you pump the accelerator or how hard you press it, the car will not speed up. However, if you take your foot off the accelerator for about 65 seconds, it will slowly regain speed. I've replaced spark plugs, timing belt, distributor cap, rotor and oil. I am also using ultra-unleaded with an octane rating of 93.5.

REPLY: Start with the small things like a dirty air filter. Then move on to the distributor itself. It could have a defective centrifugal advance or vacuum advance, or that shaft could be worn. You mentioned replacing the plugs, but were they the right ones for your car and were they gapped properly?

Other than those items, everything points to the carburetor. It could be faulty chock operation, clogged vacuum passages or a clogged main jet. No matter what, it sounds like you're due for a carburetor rebuild.

By the way, the national speed limit is 55 mph, not 70.

COMMENT: I have developed a problem in my oil pump in my 1972 luxury car. I cannot drive over five miles at 55 mph without it getting hot and causing my "temp" gauge to come on and my water/radiator getting hot. Is there anything that can be done to clean it out without physically removing it and the resultant $200-300 cost?

REPLY: Who diagnosed your problem as the oil pump? Your problem could be anything from a stuck thermostat or faulty radiator pressure cap to a faulty fan or broken water pump. But to answer your question, no, there is nothing to be done about the oil pump (or its screen) short of removing the pan and having at it. The price quoted to us locally by a dealer for a new factory oil pump, installed, was $170.36.

COMMENT: I have a 1984 compact car that's had an oil leak since day one. I've had the car back to the dealer seven or eight times. The leak disappears for a couple of days or a week when I get it from the garage and then it starts back again. It was kept in the garage four or five days at one time when all the gaskets were changed, supposedly. Is it normal for a car to have an oil leak, and why can't a qualified mechanic find it? What harm can this leak do to my car? With all the highly technical instruments why can't it be found? Why can't a technical person who was in on building the car be brought in and the leak be found?

REPLY: No, it is not normal for a car to leak oil, but it is extremely hard to find the source of the leak. The biggest problem is that the source of the leak is usually well forward of where the oil has found it convenient to drip off the car.

Places where oil can leak from include:

the spark plug gasket, cylinder head gasket, valve cover plate, camshaft rear welch plug, oil slinger, rear oil seal, oil return passage to crankcase, timing gear cover, front oil seal, timing gear cover gasket, oil return passage, front main bearing, oil pan, oil pump, rear main bearing and oil pan gasket.

An engine that is leaking a teaspoon of oil every mile will lose nearly a quart of oil every 200 miles. And it never does any good to run an engine a quart low on oil.

Unfortunately, replacing gaskets will not solve an oil leak that is a design or manufacturing flaw. In such cases, you have to document the problem completely, and then after the manufacturer admits there is a problem a fix might be instituted.

As for your last question; while your investment of $8,000 to $12,000 is a lot, it isn't enough for the manufacturer who spent millions on a design to involve design personnel in consumer-relation problems. Sad but true.

COMMENT: My 1982 V-6 engine has astounded all the professsionals. After filling up with gas, it suddenly started slowly dying out while idling. Tap the gas pedal and it will pick up and run fine for about half a minute and then start dying again. It runs fine while driving and accelerating. Also it will idle fine in cold weather when the choke is closed. I've put about 10,000 miles on it since the problems started. I have changed the fuel filter, and did all the normal checks: EGR, vacuum leaks, idle speed, fuel pump, dryer in fuel tank, compression test, timing, vacuum advance and verified the presence of fuel in the bowl after it dies.

REPLY: Sounds like a fuel vapor emission control system problem. This system consists of a sealed fuel tank, pressure/vacuum relief fuel cap, fuel tank vapor valve, vapor tube and hoses, carbon canister, purge control valve, solenoid vent valve, purge regulator valve, thermactor idle vacuum valve, thermal vent valve and external bowl vent solenoid.

Your problem could be any of these items, but the most common cause is the installation of the wrong fuel cap, which usually happens when the factory cap is replaced with a locking unit of the wrong type.

COMMENT: In my reading I've not run across any reasonable literature dealing with the problems of running unleaded fuel in an engine designed for leaded fuel. Specifically, can it be done? What are the short term and long term effects? Is some form of compensation required in the tuning (or any other modification) that will allow such an engine to burn unleaded efficiently and without harming the engine? Do the same principals apply to an engine such as that found in a Toyota Corolla and, say, a Porsche 911?

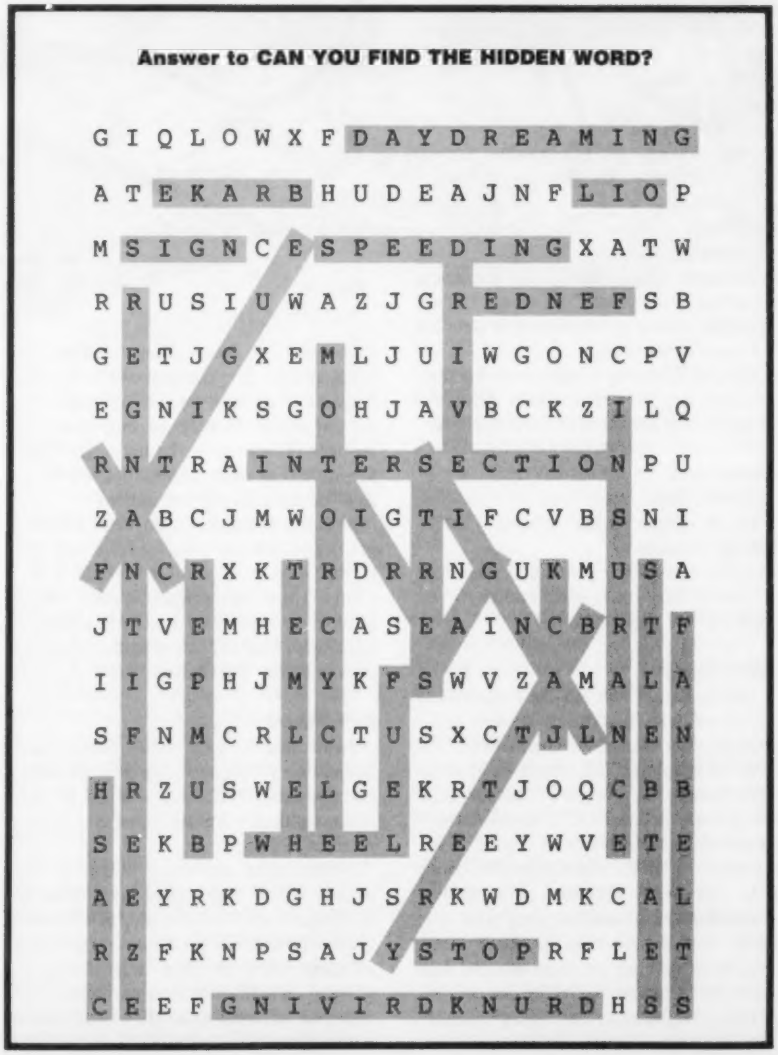
REPLY: First of all let's talk about the anti-knock qualities of leaded versus unleaded fuels. In most cases, the super unleaded gases will have enough octane (an anti-knock rating) to prevent pinging in most engines, even those designed for leaded use, with little or no adjustments to such things as timing. If the super unleaded fuel doesn't do the job, try mixing a little leaded regular with the unleaded fuel (start with one gallon of leaded to every three of unleaded).

The critical job of lead was to lubricate the valves. Not much lead was required to do this job. In fact, one tank of leaded regular provided enough lubrication for about 25,000 miles. However, since the very early '70s, valves have been made in such a way that the lubrication is no longer necessary.

If you have an honest concern about damaging the valves in an engine designed for leaded fuel, the engine should be rebuilt with newer, harder valves that don't require lead.

On the other side of the same coin, some of today's engines were designed to be run on unleaded fuel only. Because of the metallurgical composition of the piston rings and jet valve system, prolonged operation on leaded fuel will damage these engines.

Answer to CAN YOU FIND THE HIDDEN WORD?


G I Q L O W X F D A Y D R E A M I N G
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A E Y R K D G H J S R K W D M K C A L
R Z F K N P S A J Y S T O P R F L E T
C E E F G N I V I R D K N U R D H S S

DRIVER'S LICENSE REQUIREMENTS IN THE USA

Following is a list of some state rules regarding driver's licenses and military personnel, courtesy of the American Automobile Association. Questions about driver's licenses requiring more detailed answers should be referred to the individual state's motor vehicle department.

ALABAMA

Military personnel and dependents: Valid home state license honored while based in state.

ALASKA

Nonresident's license honored for 90 days after entry into state.

ARIZONA

Nonresident must obtain Arizona driver's license upon establishing residency, accepting employment, enrolling children in public school or remaining in state for six months or more.

Special licensing arrangement for resident military personnel allows use of expired license for 90 days after discharge.

ARKANSAS

Nonresident must obtain Arkansas driver's license within 90 days of establishing residence.

Resident military personnel may apply for military extension, not to exceed first tour of duty.

CALIFORNIA

Nonresident over 18 may operate a motor vehicle in state on a valid home state driver's license. Nonresident civilian over 16, but under 18, with a valid home state license may operate a motor vehicle in state without a California driver's license for no more than 10 days after entry unless a Nonresident Minor's Certificate has been obtained. Nonresident under 18 on active military duty with valid home state license may operate a motor vehicle in state for no more than 60 days after entry unless a California driver's license or a Nonresident Minor's Certificate has been obtained. California license required when establishing residence or employment for compensation for the purpose of driving on the highways. No person under 18 may be employed for purpose of driving on the highways. California license must be obtained within 10 days of establishing residence.

Military personnel with valid California license on entry into service may use license until 30 days after honorable discharge while absent from the state, unless license suspended or revoked. Licensee must have discharge or separation papers in immediate possession.

COLORADO

Nonresident with valid home state license may operate a car in Colorado. License must be obtained within 30 days when residence is established or employment is obtained.

Nonresident on active duty in the armed forces and spouse may drive in Colorado with a valid home state license. Colorado military personnel on duty out of state when driver's license expires granted an extension for a period of three years or until 90 days after their return to the state, whichever shall occur first.

CONNECTICUT

Nonresident operator's license honored on reciprocal basis; visitor's permit not required. Operator's license must be purchased within 60 days if residence is established.

Military personnel, residents of Connecticut at the time of induction, will be issued free licenses while in active service and for one licensing period after discharge. Nonresident military personnel stationed in state may use valid out-of-state driver's license.

DELAWARE

Nonresident must secure Delaware driver's license within 90 days after establishing residence in state. Delaware license not issued until out-of-state license surrendered.

Military personnel must apply for a military personnel license. Fee, $1, to be renewed every four years. Must obtain regular license within 90 days of discharge.

DISTRICT OF COLUMBIA

Nonresident operator's license honored on reciprocal basis.

Military personnel holding valid D.C. license may retain license for six years after expiration, if on duty outside of the District. However, application for extension must be made in each four-year period.

FLORIDA

Nonresident operator's license is honored on reciprocal basis; visitor's permit not required. However, if a visitor, holding a currently valid operator's permit in another state, becomes resident, obtains employment or places children in school, must secure a Florida driver's license within 30 days and surrender the out-of-state license. If the out-of-state license is retained, the Florida license will be stamped "Valid in Florida Only."

Florida military personnel may renew driver's license, without examination or delinquent fee, upon presentation within 90 days after discharge or upon being stationed in Florida. (License not valid for operation of vehicles after its expiration.)

HAWAII

Nonresident drivers from any state, U.S. territory, or Canada who are 18 years or older, permitted to drive in Hawaii as long as home state license remains valid.

Resident military personnel license, issued prior to January 1, 1968, is valid until 30 days after discharge unless they return to the state, or license is revoked or suspended for cause.

IDAHO

Nonresident's license honored on reciprocal basis; visitor's permit not required. Idaho driver's license must be purchased immediately if Idaho residence is established or gainful employment accepted. Persons living in state 90 days considered residents.

Military personnel stationed in state may maintain out-of-state driver's license.

IOWA

Nonresident operator's license from home state honored. Iowa license must be purchased immediately if residence established in state.

Expiration date of license held by military personnel extended without fee for six months following honorable discharge provided he/she is not incapacitated. Similar extension for dependents, not to exceed five years.

GEORGIA

Applicants must apply in person for initial, duplicate, or renewal licenses. Exceptions are made for certain military personnel and college students.

A nonresident is not required to obtain a Georgia driver's license for 30 days, but must supply proof of a driver's license from another state.

The Department may defer the expiration of the license of a licensee who is on active duty in the Armed Forces of the United States and stationed outside of Georgia for a period not in excess of four years, upon such terms and conditions as it may prescribe. (Military personnel and their dependents must have a valid Georgia license. This can be done by mail and returned without photograph or signature.) The Department may similarly defer the expiration of the license of the spouse or dependent son or daughter of such military personnel, if such person is residing with the military personnel.

ILLINOIS

Nonresident's license honored on reciprocal basis. Illinois driver's license must be applied for within 90 days after residence established.

Resident serving in the armed forces outside the continental limits of the United States need not obtain a driver's license for 45 days following return to the continental limits of the United States.

Expiration of license of military personnel on active duty in another state may be extended for period of service and 45 days thereafter by a waiver which may be granted by the Secretary of State.

INDIANA

Nonresident's license is honored. If permanent residence is established, or after residing in state 60 days, operator's license must be purchased immediately.

No special licensing arrangements for nonresident military personnel.

Operator's license may be reissued for good cause including military service.

KANSAS

Nonresident who is 16 or older may use a valid operator's license from home state. Kansas driver's license must be obtained if nonresident operates a vehicle bearing Kansas registration plates in excess of 90 days.

Military personnel on active duty in Kansas may use home state driver's license provided home state registration also is maintained. Kansas operator's license required if operating a Kansas registered vehicle after 90 days.

KENTUCKY

Nonresident is permitted to use his home state operator's license on reciprocal basis; visitor's permit not required. Operator's license must be purchased upon establishing residence.

(To be continued . . .)

Storage Time

You may not be moving this season, but being in the military does mean that sooner or later you are going to have to change duty stations. On some of these moves you can drive your car to the new station and on others you can have it shipped, but on some assignments you can't take your own transportation.

For those moves where you can't take your vehicle with you, you're left with three basic options: You can sell it, leave it with someone, or put it in storage.

If you decide to sell your vehicle your worries should end with the title transfer. The other two solutions aren't so simple.

Leaving your car for someone else to use as *they* see fit presents its own special problems. Regardless of whether they are going to use it as daily transportation or only drive your car occasionally, you want the vehicle treated with the same respect you give it — probably more.

Notice that we're only talking about the physical condition of the vehicle; insurance and registration problems are another story altogether. A story that varies from location to location and requires that you personally check with your local insurance agent and legal authorities.

The proper respect begins with you providing the temporary driver with complete instructions on how you want the vehicle driven. This includes starting instructions such as "take off as soon as it'll move without stumbling" or "you can drive away as soon as the temperature gauge needle starts to move."

If the vehicle is only driven occasionally the best exercise for it is 20 miles of continuous highway driving. This will burn off many of the corrosive deposits that build up if it is used exclusively for short trips.

Just as important as driving instructions are maintenance instructions based on both mileage and time. For example, if you've been changing the oil every 3000 miles, then it should be changed at least that often while someone else is driving. And if they don't drive it as often and as far as you did, then the oil should be changed every three months.

Remember, six months is the maximum inservice life of any oil regardless of how few miles it is driven. Even synthetic oils that are supposed to last a year require a filter change every six months.

The third alternative for your vehicle is storage. Clearly, leaving it parked in a garage isn't enough. The car must be properly prepared if it is not to be driven for several months.

Ideally, the vehicle should be kept in a cool, dark environment where the temperature doesn't fall below freezing. Extremely high temperatures are also dangerous. However, if the paint is marginal or the car is to be left in a fairly temperate climate, it can be stored outside.

continued

Even if you are only leaving your car for the weekend, a high-quality cover can help protect the finish. Such covers are even more important when storing your vehicle.

With the engine warm, stuff and plug the air cleaner opening. Don't forget to do the hot air supply side (the tube at the top of the photo) too.

continued

The most important thing to remember when mothballing the engine is to do it while it's warm. All the procedures are worthless if moisture has a chance to seep into a cold engine.

The fuel system can be prepared by using a siphon pump to remove as much gasoline as possible from the tank. Then let the engine run until it's out of gas. If gasoline is left in the system it will evaporate, leaving a deposit that can damage the engine and fuel components.

Mix up a three- or four-quart solution of kerosene and oil (three parts kerosene to one part oil), dump it in the tank and bounce the vehicle to thoroughly slosh and coat the inside of the tank.

Remove the spark plugs and ground the large ignition wire coming from the coil to the distributor. Pour one ounce of non-detergent oil through the spark plug port into each cylinder. Use the same weight oil you would normally use for local driving.

Reinstall the plugs, but not the coil wire. Crank the engine over five to 10 seconds. This will coat the cylinders with oil and draw the kerosene/oil mixture into the fuel pump and carburetor to help the rust-proofing process.

Change the oil and filter. Contaminants in dirty oil can cause serious problems when left in the engine.

Relieve tension on all drive belts (fan, power steering, air conditioner, A.I.R., etc.) to prevent stretching and belt damage during storage.

The coolant should be drained, the system flushed and fresh rust-inhibiting coolant added in the strengh normally used locally. Insure transmission and differential fluids are correct, also.

Remove the battery. If it's not a "lifetime" type, sell it or throw it away. The "lifetime" batteries will usually take a charge after sitting for a year or more, but a conventional battery probably won't.

Get some duct tape to plug and tape the exhaust pipe(s) and air cleaner. On older vehicles, also plug and tape the breather on the valve cover.

Use a good upholstery cleaner and lots of elbow grease on the interior. This will clean and soften the upholstery and get it ready for an application of silicone spray. Don't forget to treat all the plastic interior parts with the silicone spray including knobs, dials and a double dose for the vinyl dash. Neatsfoot oil works wonders on real leather.

A light layer of petroleum jelly will preserve chrome, while bright-metal trim needs no treatment.

If at all possible put the car on jack stands or blocks and remove the tires and wheels. If for any reason you can't take the tires and wheels off, jacking will at least eliminate tire flat-spotting as well as ease the strain on shocks, wheel bearings, etc. If the car can't be lifted off the ground, increase the air pressure in each tire 10 to 15 psi.

Try to leave the car in neutral with the parking brake off. It would also be wise to cut a piece of wood long enough to fit from the bottom of the dash to fully depress the clutch.

Finally, open a window just a crack and cover the vehicle with a top quality car cover. Don't use plastic to cover the car because it can't breathe and moisture will be trapped against the body. If the car is being left in a windy area you may not want to cover it all. The wind will cause the cover to flap and ruin the paint.

When you return, just reverse the preparation process. Add gasoline (the kerosene/oil mixture will probably have evaporated), install a freshly charged battery and tighten all the belts. Check all fluid levels such as the radiator, oil and differential. Don't forget to check the tire pressures also.

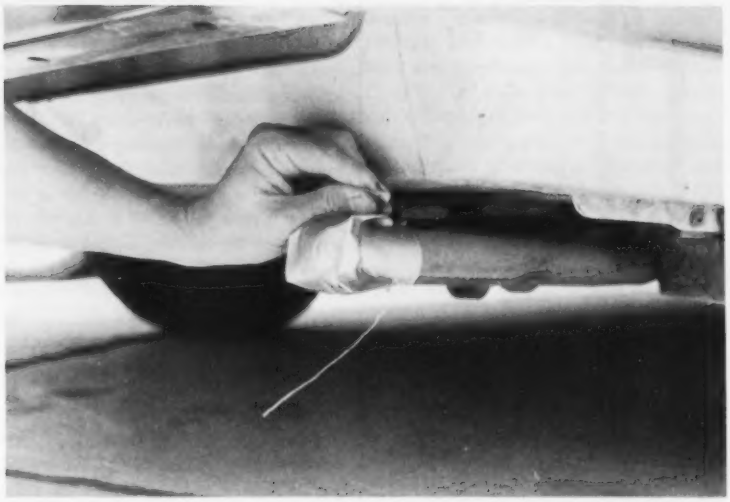
Disconnect the fuel line between the fuel pump and carburetor. Provide a safe catch basin for the fuel and turn the engine over for 10 to 15 seconds. This will both pump out any residue in the fuel line and provide oil to engine parts.

Reconnect the fuel line, reinstall (underground) the coil wire, install new spark plugs and start the engine. It may be hard to start and run evenly at first, but it should smooth out in a few minutes.

Before driving away, check for fluid leaks, make sure all the lights are working and double-check the brakes. Now you can buckle up and start to drive off slowly, triple-checking braking action as well as steering control.

Once the opening is plugged, seal it with duct (silver-colored fabric) tape.

While you do have to plug the oil breather on older model cars, this is a newer engine with pollution controls and therefore already has a closed system.



Don't forget to plug and seal the exhaust end of the engine also.

Jack stands or blocks will ease the strain on shocks, wheel bearings, etc., while you're gone.

BATTERY TIP

On page 24 of the December 1984 magazine, you show a picture of a person hooking up a battery cable to the radiator mount frame of a car with a dead battery. This should not be done.

The negative battery cable is bolted to the block of an engine. This is done by the manufacturer due to the high current draw of a starter. The ground to the chassis of most cars is provided by small bonding straps to the engine from the car body. The bonding straps are not designed to carry the current needed to start a car.

The battery jumper should be hooked to the engine. The jumping car should be hooked up first and the positive cable should be put on the battery of the stalled car, then the connection should be made to the *engine block* of the stalled car. The reason for hooking the running car up first is the battery in the running car is under a state of activity (being charged) and will have much more hydrogen around it then the low or dead battery. I have been an Auto Electrician for many years in Alaska. I have seen the results of cars that were hooked up as you show in the picture. It is something that will happen more on older cars then the newer ones. If the battery is low or dead it is very likely that the bonding is weak, causing the regulator to work improperly, the battery to overcharge and go bad or burn up from heat of the alternator overcharge. The regulator does not see the corret voltage through bad or poor bonding straps.

Thank you for the good safety tips in your article.

Sgt. Merlin J. Cowell II
Ft. Wainright, AK 99703

Thank you for the tip. We've never come across the problem of an overcharged battery because of weak bonding straps before. However, we do recommend ***against*** *jumping a battery from a running car. If there is a major problem with the non-running car it could cause severe problems to the elecrical system on the running car. Use only the battery of the good car to jump the dead one (turn off the ignition and remove the keys). If this isn't enough elecrical power to start the dead car, there's something more wrong than just a dead battery.*

FREEDOM OF CHOICE

I have been reading *DRIVER* Magazine for a number of years and have truly enjoyed nearly every article ever put together by your staff.

I have been riding motorcycles off and on for over 20 years. I started riding in northern California and can remember in our small community of being stopped on a number of occasions just to check my license and registration because I was wearing leather pants, jacket, gloves and a helmet with full face shield. After the policeman found out that I was a local boy everything was fine and he would ask why I was dressed in all that "getup." I always responded that I was so skinny that I couldn't afford to lose any skin.

I am a firm believer in wearing protective clothing but I also feel no one has the right to tell anyone that they have to wear protective clothing and helmets. This country was founded on freedom of choice and I agree we must protect the citizens but sometimes we carry it a bit far.

Keep up the outstanding magazine and thanks for your time.

SFC John F. Willis, USA
Townsend, MA 01469

JUNIORS' DRIVERS LICENSE INFORMATION

We here at Peru (High School) have been receiving your magazine now for several years and are well pleased with the diversity of safety topics, many of which are used in our classroom as handouts and reference articles in the school library with our homework assignments dealing with alcohol/other drugs and driving. Your array of motorcycle articles are also very useful. Both my wife and I own our own bikes.

One item I am frequently asked by students and parents and do not usually have a total up-to-date answer on is as follows: Parents usually want to know what states can their sons/daughters drive in at 16 or 17, with a New York State Junior Operator's License when they go on vacation; as well as what restrictions, say, to hours of operation in these other states with that license.

I do not remember if such an article has appeared in *DRIVER* since we've been receiving it. I believe a chart of the 50 states, age to secure a license, type(s) of licenses available at certain ages and their hours of operation would be most helpful to those of us who teach Driver Education as well as to military families coast-to-coast. This would save time from securing this sort of information from each state Department of Motor Vehicle offices, as vacationers travel from state-to-state.

Please keep up the excellent job that your magazine is doing!

Robert Rumph
Peru, NY 12972

We're including the beginning of a listing of state laws on driver's licenses in this issue (it will be completed in consecutive issues). For more specific information on any state, the easiest way is to contact your auto club or that state's department of motor vehicles.

LEFT LANE RIGHT?

In your article "Why Didn't the Other Driver See Me?", in your December 1984 issue, you suggest that a motorcyclist ride in the extreme left lane. In theory this sounds good. I have been riding for about 23 years and in my states of New York and Connecticut the law states that a vehicle must keep right except to pass.

MKC Ronald F. Alves, USCG
Marcus Island, Japan

Our resident motorcyclist says he has never known such laws to be enforced.

PROBLEMS?

The cover facing page (December 1984 *DRIVER)* shows the smiling sergeant and his family "driving" his car with a few minor problems: 1) His hand

position is unusually low for the right hand. Perhaps he could turn better if the car were not in park. 2) His vision is partially blocked by the tag hanging from the rear view mirror. 3) He could probably steer better if the ignition were turned on. Steering lock is really hard to turn against.

OK, so he's really not driving. He's parked. But the picture could have been staged better.

SSgt. Lawrence C. Parthum, USAF
Offutt AFB, Ne 68113

You missed the fact that the right hand door is open. But these are trivial matters. The point is that people do drive this way — holding their children rather than putting them into a child seat or a seat belt — and we've all seen it. Please, readers, protect the health and safety of your children. Don't try to hold them in the car.

SERIOUS STUFF

First, thanks for the picture of the Mustang coming out of turn two at Sears Point. As a motorcycle club road racer I always enjoy seeing pictures of other drivers having fun at the best places I've found to drive fast.

Now for the serious stuff: In your February issue you began to cover "accepting responsibility." I have ridden over 120,000 miles in the last five years on four motorcycles from 500 to 1100 ccs. In that time I have never come close to having any altercation with another vehicle. Some call it defensive driving. I call it expecting the other guy to do the stupidest possible thing at any given time. However you look at it, it all boils down to one simple thing: The rider alone is responsible for what happens on the motorcycle. Your statement "Everything that happens to you on your bike is the result of something you did or didn't do," sounds almost like a direct quote from Keith Codes' *A Twist of the Wrist*, the best book written on motorcycle riding, particularly high speed riding. Having raced the last two seasons with the AFM (American Federation of Motorcyclists) I 100% concur with that attitude. I have fallen off more than my fair share of times but *every single time* my falling was *directly* attributable to a mistake *I* made.

The most frequent problem I have seen on the road isn't the "inherent danger" of motorcycles (I don't feel that a properly set-up and equipped bike *and* rider are subject to "inherently" more danger than anyone else on the road), it is the new rider who hasn't had the concept of *not* being surrounded by plastic, glass, and steel driven home to him. With today's "superbikes" capable of well over 100 mph, outstanding handling to match and no restrictions on *new* riders to keep them off these machines, we have a situation where an inexperienced rider on a high power machine gets in well over his head and, much to his chagrin, finds out that the laws of physics cannot be defied, and so crashes. Sometimes he gets up and walks away, sometimes the ambulance drives him away, and far too frequently his commander ends up calling on his next-of-kin to tell them their son/daughter has been killed in a motorcycling accident.

The saddest fact of all is that it is totally unnecessary. My Yamaha 1100 accelerates from *0-100* mph in *7.0* seconds. Add one new rider, a little bit of alcohol and we have an instant formula for another statistic. So far the only people I see trying to correct this situation are the insurance people. One company wanted over $2,000 for one year's insurance on my 1100. We the motorcyclists of this country need to make a positive effort to keep these new riders on machines that are not beyond their abilities. When an inexperienced rider falls and wrecks himself and his bike *we all lose*. The bike dealer loses a repeat customer, *all riders* pay higher insurance rates. One less rider means fewer motorcycles meaning higher service, parts, and accessory prices. It works *against* all who like to ride.

We as motorcyclists are responsible in a very real sense for what happens. If you have a friend interested in riding, get him/her to the Motorcycle Safety Foundation Course. It just might save someone's life (maybe yours if you go riding with this person). If the person can't learn to ride sanely on the street, get him to a race track. The California Superbike School is your best bet for finding out just how slow you really are without investing a lot of money in equipment to club race. If you like racing, do it at the race track; all you prove on the street is how stupid you are.

Last, but certainly not least, in my opinion, riding without *full* equipment (helmet, *full* coverage *leather* gloves, leather boots, at *least* a leather jacket) *no matter what* the temperature (I have sat at many a traffic light in 100-plus degree heat and had sweat run down my back and arms) is foolish at best. During the five years I road-raced bicycles. I lost many battles of bare skin vs. asphalt at surprisingly low speeds and I guarantee you that if you fall off without protection you will lose a considerable amount of skin, and worst of all those nurses at the hospital are *merciless* with the wire brushes and Betadine solution. Thanks for listening!

SSgt. Lance Wolrab, USAF
Sacramento, CA 95842

SLOW SPEED NO GUARANTEE

Here is a story that may be of interest. It happened to me and my son.

On 12 April 1985 my 9-month-old son and I were in a long line of cars waiting for the stoplight to turn green. I happened to look in my rearview mirror and all I could see was the front of a semi-truck! It wasn't stopping! Fortunately it was traveling at a slow speed. It hit us and knocked my Ford Escort forward and I jerked forward against my seat belt. I felt as if the wind had been knocked out of me. I turned around to make sure my baby was OK only in time to be hit a second time! I thank God for seat belts because I saw my baby jerk forward and back again against his car seat! That told me right then that without being buckled in he would have been thrown forward, who knows how far.

A lot of people don't realize that collisions at slow speeds can have a big impact. Both times we were hit the impact sounded like a cannon shot. There was no damage to my car because my bumpers had done their job. The point I hope to get across is to buckle up your children and yourself. Being hit at a slow speed is no guarantee against getting hurt.

By the way, the light was still red when the semi hit us and the driver of the semi-truck did not pull over as I did to see if we were OK or if he had caused any damage.

SSgt. Jerri A. Jones, USAF
Norton AFB, CA 92409

Address your letters to:

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DRIVER Magazine
AFISC/SEDD
Norton AFB CA 92409

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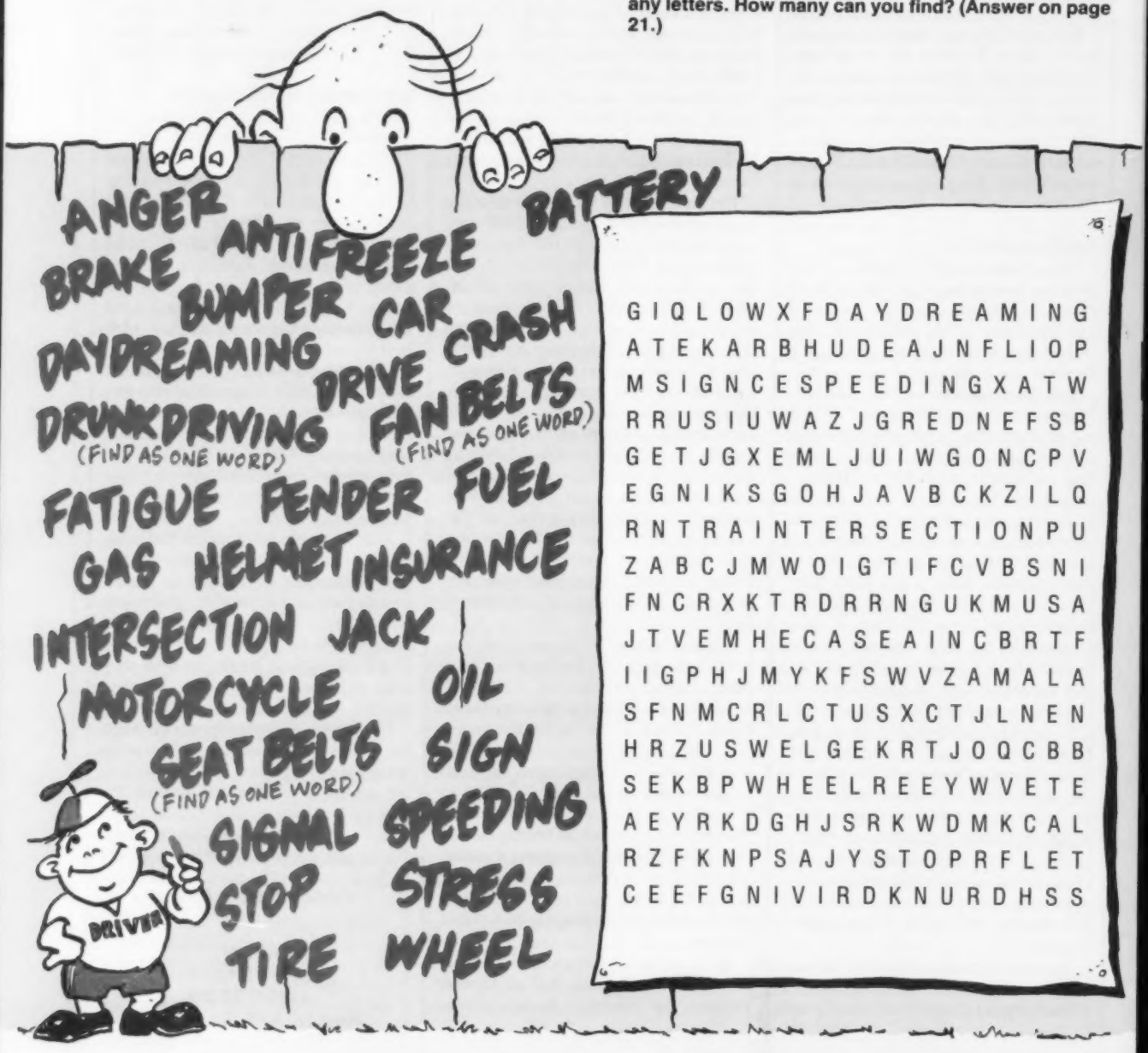
CAN YOU FIND THE HIDDEN WORDS?

by AW2 MARIHUGH, VX-1
Naval Air Station
Patuxent River, Maryland

The 29 words and phrases in the list below are associated with vehicles and are hidden in this puzzle. They can be found up, down, backwards, or diagonally and they are always in a straight line, never skipping over any letters. How many can you find? (Answer on page 21.)


ANGER
ANTIFREEZE
BATTERY
BRAKE
BUMPER
CAR
CRASH
DAYDREAMING
DRIVE
DRUNKDRIVING
(FIND AS ONE WORD)
FAN BELTS
(FIND AS ONE WORD)
FATIGUE
FENDER
FUEL
GAS
HELMET
INSURANCE
INTERSECTION
JACK
MOTORCYCLE
OIL
SEAT BELTS
(FIND AS ONE WORD)
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G E T J G X E M L J U I W G O N C P V
E G N I K S G O H J A V B C K Z I L Q
R N T R A I N T E R S E C T I O N P U
Z A B C J M W O I G T I F C V B S N I
F N C R X K T R D R R N G U K M U S A
J T V E M H E C A S E A I N C B R T F
I I G P H J M Y K F S W V Z A M A L A
S F N M C R L C T U S X C T J L N E N
H R Z U S W E L G E K R T J O Q C B B
S E K B P W H E E L R E E Y W V E T E
A E Y R K D G H J S R K W D M K C A L
R Z F K N P S A J Y S T O P R F L E T
C E E F G N I V I R D K N U R D H S S